REMARKS/ARGUMENTS

Claims 1-27 were previously pending in the application. Claim 27 is amended, and new claims 28-29 are added herein. Support for new claims 28-29 is found in Figs. 7-12. Assuming the entry of this amendment, claims 1-29 are now pending in the application. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

Finality of Office Action

The Applicant submits that the finality of the pending office action is improper. In the first office action dated 8/18/05, the Examiner indicated that original claims 3 and 17 were directed to allowable subject matter. In response, the Applicant added claims 26 and 27, which are equivalent to original claims 3 and 17, respectively, rewritten in independent form. The Examiner apparently changed his mind about the allowability of that subject matter, because, in the pending office action, the Examiner rejected claims 26 and 27 under 35 U.S.C. 103(a). Since the subject matter of original claims 3 and 17 is rejected for the first time in the pending office action, the Applicant submits that the finality of the pending office action is improper and should be removed.

Claim Objections

In paragraph 2 of the final office action, the Examiner objected to claim 27 due to an informality. In response, the Applicant has amended claim 27, as suggested by the Examiner, to recite "(d)" instead of "(4)". This amendment was not made to overcome any prior-art rejection.

Prior-Art Rejections

In paragraph 4, the Examiner rejected claims 1-2, 8, and 15-16 under 35 U.S.C. 103(a) as being unpatentable over Andrews in view of Blauvelt and Moriyama. In paragraph 12, the Examiner rejected claims 7, 9-10, and 21-25 under Section 103(a) as being unpatentable over Andrews in view of Blauvelt and Moriyama, and further in view of Kim. In paragraph 21, the Examiner rejected claim 26 under Section 103(a) as being unpatentable over Andrews in view of Blauvelt. In paragraph 24, the Examiner rejected claim 27 under Section 103(a) as being unpatentable over Blauvelt in view of Danielsons. In paragraph 30, the Examiner objected to claims 3-6, 11-14, and 17-20 as being dependent upon a rejected base claim, but indicated that those claims would be allowable if rewritten in independent form. For the following reasons, the Applicant submits that all of the now-pending claims are allowable over the cited references.

Claims 1, 15, and 25

According to previously presented claim 1, the frequency-dependent phase pre-distortion is based on at least one corresponding phase difference between at least one pair of critical frequencies. None of the cited references teaches or even suggests such a feature.

In paragraph 7, the Examiner admitted that "Andrews does not teach wherein the frequency dependent phase pre-distortion is based on at least one corresponding phase difference between at least one pair of critical frequencies." Instead, the Examiner stated that Moriyama "teaches wherein the frequency dependent phase pre-distortion is based on at least one corresponding phase difference between at least one pair of critical frequencies," citing Moriyama's Abstract; column 26, lines 52-53;

column 27, lines 36-37; and column 4, lines 25-27. For the following reasons, the Applicant submits that the Examiner mischaracterized the teachings in Moriyama in rejecting claim 1.

In particular, Moriyama does not teach frequency-dependent phase pre-distortion. Rather, Moriyama teaches frequency-independent phase pre-distortion. Frequency-independent phase pre-distortion refers to pre-distortion of the phase of an input signal, where the amount of phase pre-distortion is independent of the frequency of the input signal. In typical frequency-independent phase pre-distortion, the amount of phase pre-distortion is a function of the signal power. Frequency-dependent phase pre-distortion, on the other hand, refers to pre-distortion of the phase of an input signal, where the amount of phase pre-distortion is a function of the frequency of the input signal.

While it is true that Moriyama teaches phase pre-distortion, the phase pre-distortion in Moriyama is independent of the frequency of the input signal. See, e.g., Moriyama's Fig. 62, which shows the dependence of the gain and phase of the amplifier output signal on the input signal power. See also column 54, lines 29-31 ("as shown in FIG. **62**, the output phase of the transmission power amplifier **30** varies in dependence upon the input power (input level)") There is no similar discussion anywhere in Moriyama about the dependence of either the gain or the phase of the amplifier output signal on the frequency of the input signal.

The teachings in Moriyama are directed to three different signal-processing techniques: (1) frequency-independent phase pre-distortion, (2) phase-shift nulling, and (3) offset compensation for an orthogonal modulator.

As discussed previously, Moriyama's frequency-independent phase pre-distortion relates to pre-distortion of the phase of an input signal to compensate for phase distortion during amplification of the input signal by an amplifier, where the amount of phase distortion caused by the amplifier -- and therefore the amount of compensating phase pre-distortion applied to the input signal prior to that amplification -- is dependent on the input signal power, as shown, for example, in Fig. 62. There is no teaching or even suggestion in Moriyama that the phase pre-distortion is dependent on the frequency of the input signal.

The second technique taught in Moriyama is phase-shift nulling, which relates to the adjustment of the phase of the input signal to ensure that the phase of the output signal matches the phase of the input signal. This phase adjustment is shown, for example, in Moriyama's Fig. 7A, where phase-difference measurement unit **24e** measures the difference in phase $d\theta$ between the signal represented by I and Q and a feedback signal represented by I_F and Q_F, where the phase difference $d\theta$ is applied to phase-difference correction unit **24h**, which rotates the signal I, Q to form a phase-adjusted signal represented by I_C and Q_C. Significantly, this phase adjustment is independent of the frequency of the input signal.

The third technique taught in Moriyama is offset compensation for an orthogonal modulator. An ideal orthogonal modulator modulates an input carrier signal to generate a resulting modulated signal that contains none of the input carrier signal. However, due to imperfections in a real-world implementation of an orthogonal modulator (referred to in Moriyama as "offset"), some carrier signal may leak through to the modulated signal. To address this problem, Moriyama shifts the phase of the reference carrier wave to compensate for this carrier leakage. Significantly, this offset compensation has nothing to do with frequency-dependent phase pre-distortion to compensate for phase distortion caused by an amplifier.

The passages in Moriyama cited by the Examiner do not support the Examiner's conclusion that Moriyama teaches frequency-dependent phase pre-distortion. In particular, the Abstract suggests

shifting "the phase of the reference carrier wave in such a manner that the leakage carrier (offset) becomes zero." This teaching relates to offset compensation for an orthogonal modulator and has nothing to do with frequency-dependent phase pre-distortion for an amplifier.

Similarly, in column 26, lines 52-53, Moriyama teaches that "the baseband outputs of the orthogonal detector **135** are rotated in terms of phase by the difference frequency between two reference carrier frequencies, thereby making it possible to obtain the offset of the orthogonal detector." Column 27, lines 36-37, contains analogous teachings for orthogonal detector **206**. These teachings are also related to offset compensation for orthogonal modulators and have nothing to do with frequency-dependent phase pre-distortion for an amplifier.

In column 4, lines 25-27, Moriyama suggests that "a technique which corrects for phase difference is required in a communication apparatus having a distortion compensating function." These teachings refer generally to both Moriyama's phase pre-distortion and Moriyama's phase-shift nulling, neither of which is dependent on the frequency of the input signal.

In view of the foregoing, the Applicant submits that (1) Moriyama does not teach frequency-dependent phase pre-distortion, (2) the Examiner mischaracterized the teachings of Moriyama in concluding that Moriyama does teach frequency-dependent phase pre-distortion, and (3) the Examiner's rejection of claim 1 based on those mischaracterized teachings is improper. In support of these conclusions, the Applicant submits herewith a Declaration under 37 CFR 1.132 executed by inventor George Vella-Coleiro.

The Applicant submits therefore that previously presented claim 1 is allowable over the cited references. For similar reasons, the Applicant submits that previously presented claims 15 and 25 are allowable over the cited references. Since claims 2-14 and 15-24 depend variously from claims 1 and 15, it is further submitted that those claims are also allowable over the cited references.

Claim 26

According to previously presented claim 26, (1) frequency-independent magnitude and phase pre-distortion is applied to the input signal to generate a main output signal, (2) one or more frequency-dependent phase pre-distortion signals are generated from the input signal, (3) each frequency-dependent phase pre-distortion signal is advanced or delayed relative to the main output signal, and (4) each advanced or delayed frequency-dependent phase pre-distortion signal is combined with the main output signal to generate the pre-distorted output signal.

Thus, according to claim 26, the pre-distorted output signal (which is to be applied to the amplifier) is generated by combining at least two signals: (1) a main output signal generated by applying frequence-independent magnitude and phase pre-distortion to the input signal and (2) one or more (advanced or delayed) frequency-dependent phase pre-distortion signals.

The Examiner rejected claim 26 based on a combination of teachings in Andrews and Blauvelt. The Applicant submits that Andrews and Blauvelt do not teach the features recited in claim 26.

Andrews teaches the generation of only one pre-distortion signal at a time. In particular, as shown in Fig. 1, selection control unit 16 controls selection switch 14 to select one and only one of predistortion circuits 8, 10, and 12 at a time. Thus, Andrews does not teach or even suggest the generation and combination of two or more different pre-distortion signals.

Fig. 8 of Blauvelt teaches the generation and combination of two different pre-distortion signals. In particular, Fig. 8 teaches a hybrid predistortion circuit in which (1) a first pre-distortion signal is generated by distorter B and (2) a second pre-distortion signal is generated by distorter D, the filter, and the delay, where the first and second pre-distortion signal are combined for further pre-distortion by distorter C. According to the Examiner in paragraph 26, however, "Blauvelt does not teach to apply frequency-independent magnitude and phase pre-distortion."

Thus, there is no teaching in Andrews and Blauvelt for the generation and combination of at least two pre-distortion signals where (1) a first pre-distortion signal is generated by applying frequency-independent magnitude and phase pre-distortion to an input signal and (2) one or more other pre-distortion signals are frequency-dependent phase pre-distortion signals that are advanced or delayed relative to the first pre-distortion signal.

The Applicant submits therefore that previously presented claim 26 is allowable over the cited references. Since new claim 28 depends from claim 26, the Applicant submits that new claim 28 is also allowable over the cited references.

Claim 27

According to currently amended claim 27, (a) a main signal processing path applies frequency-independent magnitude and phase pre-distortion to the input signal to generate a main output signal, (b) one or more frequency-dependent phase pre-distortion paths generate one or more frequency-dependent phase pre-distortion signals from the input signal, (c) one or more delay blocks advance or delay each frequency-dependent phase pre-distortion signal relative to the main output signal, and (d) a combiner combines each advanced or delayed frequency-dependent phase pre-distortion signal with the main output signal to generate a pre-distorted output signal, such that, when the pre-distorted output signal is applied to an amplifier to generate the amplified signal, the frequency-dependent phase pre-distortion reduces spurious emissions in the amplified signal.

The Examiner rejected claim 27 based on a combination of teachings in Blauvelt and Danielsons. The Applicant submits that the Examiner improperly combined the teachings of Blauvelt and Danielsons in rejecting claim 27.

While it is true that Blauvelt teaches two parallel pre-distortion paths (see, e.g., Fig. 8), the Examiner stated in paragraph 26 that "Blauvelt does not teach to apply frequency-independent magnitude and phase pre-distortion." And, while it is true that Danielsons teaches frequency-independent magnitude and phase pre-distortion, Danielsons teaches only a single pre-distortion path (see, e.g., Fig. 16). The Applicant submits that there is no suggestion in the prior art for replacing one of Blauvelt's parallel pre-distortion paths with Danielsons' single frequency-independent pre-distortion path.

To the contrary, the Applicant submits that the Examiner's rejection of claim 27 is based on nothing more than hindsight, where the claimed invention is impermissibly used as a blueprint for picking and choosing different features from different prior-art references.

According to the Examiner in paragraph 26, the claimed invention would have been obvious "because the combined teaching of Blauvelt with Danielsons suggest apply frequency-independent magnitude and phase pre-distortion as recited by the instant claims." This "reason" is nothing more than a restatement of the result without providing any justification for the result.

The Examiner also stated in paragraph 26 that there is motivation to combine the teachings of Blauvelt with Danielsons "because Blauvelt suggests predistortion (something broad) in general and Danielsons suggests the beneficial use of frequency independent predistortion to remove dependency on frequency and instead be dependent on data conditions in order to have better error handling ... in the analogous art of predistortion," citing Danielsons, column 2, lines 22-30.

According to the passage cited by the Examiner, two objects of Danielsons' invention are "to provide a novel circuit and system for error handling in a television signal" and "to provide a novel circuit and system for television transmission where the data signal has its dependency on the frequency of the digital data rate removed and the frequency corrected to its nominal conditions." The Applicant submits that the Examiner has mischaracterized these teachings in Danielsons and improperly applied them as a motivation for combining the teachings of Blauvelt and Danielsons to provide the claimed invention.

The passage cited by the Examiner is related to the goal of removing the dependence of the data signal on the frequency of the digital data rate. This has nothing to do with the application of pre-distortion that is independent of the frequency of the data signal.

Danielsons teaches in Fig. 16 four signal processing circuits upstream of the amplifier circuitry: frequency response and phase corrector circuits 160 and 166, phase corrector circuit 162, and linearity corrector circuit 164. Phase corrector circuit 162 applies frequency-independent phase pre-distortion, while linearity corrector circuit 164 applies frequency-independent magnitude pre-distortion. Frequency response and phase corrector circuits 160 and 166, on the other hand, are equalizers that compensate for the amplifier's imperfect frequency response, where the correction is independent of the magnitude of the input signal. See, e.g., column 12, lines 5-10 and 35-45. As such, frequency response and phase corrector circuits 160 and 166 do not apply pre-distortion as that term is known and used by those skilled in the art.

The teachings in column 2, lines 22-30, of Danielsons cited by the Examiner relate to the processing of frequency response and phase corrector circuits 160 and 166, not to the processing of phase and linearity corrector circuits 162 and 164. In other words, the cited teachings relate to equalization processing, not to pre-distortion processing. As such, they cannot be properly cited as motivation for replacing one of Blauvelt's parallel pre-distortion paths with Danielsons' single frequency-independent magnitude and phase pre-distortion path.

In view of the foregoing, the Applicant submits that currently amended claim 27 is allowable over the cited references. Since new claim 29 depends from claim 27, the Applicant submits that new claim 29 is also allowable over the cited references.

New Claims 28-29

According to new claim 28, two or more frequency-dependent phase pre-distortion signals are generated from the input signal, where two or more (advanced or delayed) frequency-dependent phase pre-distortion signals are combined with the main (i.e., frequency-independent magnitude and phase pre-distortion) output signal to generate the pre-distorted output signal, which is applied to the amplifier.

According to new claim 29, two or more frequency-dependent phase pre-distortion paths generate two or more frequency-dependent phase pre-distortion signals from the input signal, and two or more delay blocks advance or delay each frequency-dependent phase pre-distortion signal relative to the main output signal, where the two or more (advanced or delayed) frequency-dependent phase pre-

distortion signals are combined with the main (i.e., frequency-independent magnitude and phase pre-distortion) output signal to generate the pre-distorted output signal, which is applied to the amplifier.

The Applicant submits that this provides additional reasons for the allowability of claims 28-29 over the cited references.

In view of the foregoing, the Applicant submits that the rejections of claims under Section 103(a) have been overcome.

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

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